

Name: _____

Chemistry 129.02 Fall 2010

General Chemistry

Examination #1:

Equations, constants and periodic table are provided.

You may use a calculator.

Show all your work!

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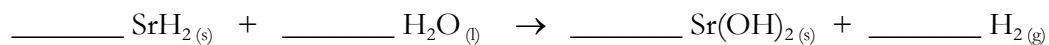
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Bonus: _____/2

Total: _____/100

1. (17 pts.) Metal hydrides react with water to form hydrogen gas and the metal hydroxide. Consider the reaction of 5.63g SrH_2 with 4.80g H_2O .

a) Balance the chemical equation for this reaction. (2 pts.)



b) How many **grams** of H_2 will be produced? Which is the limiting reactant? What is the theoretical yield? (12 pts.)

Limiting Reactant: _____

Theoretical Yield: _____

c) If the actual yield is 0.129 g, what is the percent yield? (3 pts.)

2. (6 pts.) When an evacuated 63.8 mL glass bulb is filled with a gas at 22°C and 760 torr, the bulb gains 0.103g in mass. Is the gas N₂, Ne, or Ar?
3. (10 pts) Cortisol, one of the major steroid hormones, has the following percent composition has a molar mass of 362.47 g/mol: C, 69.6%; H, 8.34%; O, 22.1%. Find its empirical and molecular formulas.

Empirical Formula: _____

Molecular Formula: _____

4. (4 pts.) In the Rutherford nuclear-atom model, _____.
- (a) neutrons and electrons reside in the nucleus
 - (b) the heavy subatomic particles, protons and neutrons, reside outside the nucleus
 - (c) the nucleus is positively charged and most of the mass resides in it
 - (d) protons, neutrons, and electrons have essentially the same mass
 - (e) mass is spread uniformly throughout the atom
5. (4 pts.) Which of these electron transitions corresponds to absorption of energy and which to emission?
- (a) $n = 2$ to $n = 4$ _____
 - (b) $n = 3$ to $n = 1$ _____
 - (c) $n = 5$ to $n = 2$ _____
 - (d) $n = 3$ to $n = 4$ _____
6. (6 pts) The C–O bond in an organic compound absorbs radiation of wavelength 9600 nm. (a) What frequency(in s^{-1}) corresponds to that of wavelength? (b)What type of electromagnetic radiation is this?

7. (11 pts.) Fill in the gaps in the following table. Each column may represent a neutral atom or an ion.

Symbol	$^{79}_{35}\text{Br}^{1-}$		
Protons		40	37
Neutrons		50	
Electrons			36
Mass Number			85
Charge		0	

8. (4 pts.) The elements in groups 1A and 7A are all quite reactive. What is a major difference between them?
- (a) Group 1A elements gain electrons in chemical reactions while group 7A elements lose electrons.
 - (b) Group 7A elements are nonmetals and group 1A elements are metalloids.
 - (c) Group 1A elements lose electrons in chemical reactions while group 7A elements gain electrons.
 - (d) Group 7A elements form 1+ cations and group 1A elements form 1- anions.

9. (12 pts.) Fill in the gaps in the following table.

Name	Formula	Ionic or Covalent?
	SCl_4	
ammonium bromide		
	PbO_2	
NaHCO_3		
	silver nitrate	
nitrogen trioxide		

10. (6 pts) Using the periodic table as a reference, determine whether a bond between each of the following pairs of atoms is polar, nonpolar or ionic? Which is the most electronegative atom in each pair?

(a) F and F

(b) K and Cl

(c) P and O

11. (8 pts) The thiocyanate ion (NCS^-) has three possible Lewis structures.

(a) Draw these three Lewis structures, and assign formal charges to the atoms in each structure.

(b) Which Lewis structure is the preferred one? Why?

12. (12 pts.) Consider the following molecules: **N₂O** , **XeF₄** , **SCl₄**. (i) Draw their Lewis structure, (ii) Determine the electron and molecular geometries, (iii) Is the molecule polar or nonpolar?

(a) N₂O

Electron Domain Geometry: _____

Molecular Geometry: _____

Polar or Nonpolar?: _____

(b) XeF₄

Electron Domain Geometry: _____

Molecular Geometry: _____

Polar or Nonpolar?: _____

(c) SCl₄

Electron Domain Geometry: _____

Molecular Geometry: _____

Polar or Nonpolar?: _____

Bonus:

(2 pts) Give an example of one greenhouse gases and its source.

Equations, constants and conversion factors

$$E_{\text{photon}} = h\nu = \frac{hc}{\lambda}$$

$$\nu = \frac{c}{\lambda}$$

$$PV = nRT$$

$$MM = \frac{mRT}{PV}$$

$$K = ^\circ\text{C} + 273.15$$

$$1 \text{ nm} = 10^{-9} \text{ m}$$

$$1 \text{ mL} = 10^{-3} \text{ L}$$

$$1 \text{ atm} = 760 \text{ torr}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$R = 0.0821 \text{ L}\cdot\text{atm}/(\text{mol}\cdot\text{K})$$

